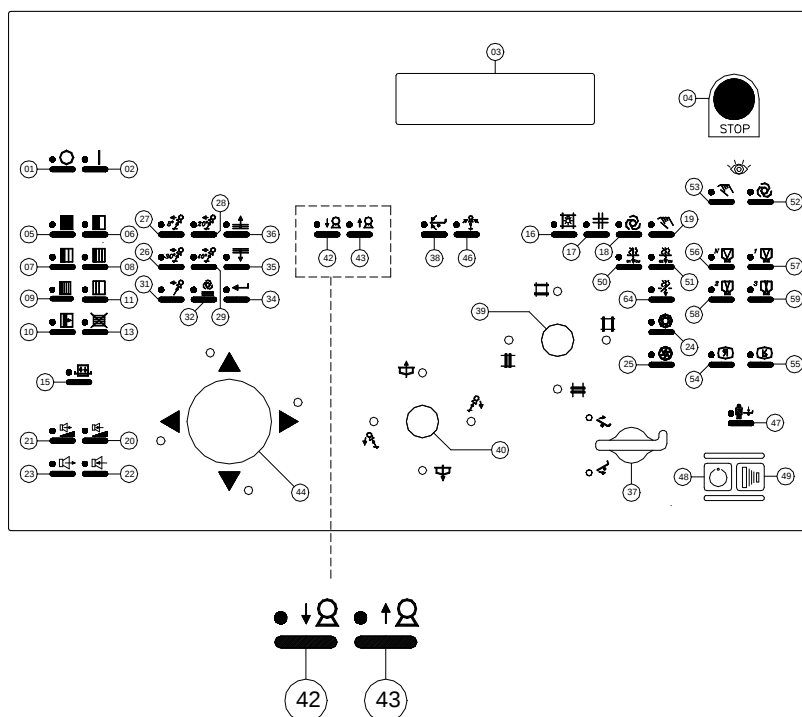


13 SFD CORRETTIVE MAINTENANCE

13.1 FOREWORD

The **CLISIS** remote tilting table Spot Film Device is equipped with a software package that allows the service personnel to set various configurations and calibration parameters, that are stored into the CPU serial eeprom. To run the service software is necessary to enter the unit maintenance mode carrying out the following procedure:

- 1 Switch on the unit and, while the led of the control desk keyboard are flashing, press and hold at the same time buttons **42** and **43**.



- 2 until the following message appears on the alphanumeric display.

CLISIS SERVICE MODE

- 3 Release the 4 keys and wait for the console CPU to complete the self-test and the CAN bus initialization.
At this point the indication that the console performs the Maintenance Mode appears on the display.

The unit set-up routine is divided in different sub menu that can be selected as hereinafter described:

Pressing button **22** it is possible to go forward in the service menu list;

Pressing button **23** it is possible to go backward in the service menu list;

Pressing button **20** it is possible to go forward in the parameters list of the selected menu;

Pressing button **21** it is possible to go backward in the parameters list of the selected menu;

Once selected the service menu and the parameter to be modified, the installer can modify the parameter value pressing buttons **31** or **32** and store the parameter value in the serial eeprom pressing button **34**.

The maintenance mode can be abandoned in any moment pressing the **preparation** button.

NOTE

When the unit enters the maintenance mode, the most of the safety controls are disabled.
In particular:

1. The Anti collision routine is disabled;
2. All safety controls related with potentiometers and encoders sensing circuits are disabled;
3. All movements can be operated by the service personnel only at the control desk side.
Only the end of the travel micro switches can stop the movements;
4. The feedback signals from all power drivers are ignored;
5. The movements speed can be modified only by the sensing potentiometer value (low speed close to travel limits)

FOR SUCH REASONS SERVICE PERSONNELL IS REQUESTED TO OPERATE THE UNIT BEING VERY CAREFULL NOT TO PRODUCE DAMAGES TO THE UNIT AND/OR INJURY ANY OTHER PERSON PRESENTS IN THE ROOM.

WARNING:

In maintenance mode the SFD keyboard pushbuttons have a different meaning. So be sure to press only the key specified in each single procedure.

NOTE:

THE SFD CPU IS ABLE TO RECOGNIZE BOTH MILLIMETRIC AND INCHES CASSETTES. IN THE FOLLOWING SECTIONS THE CALIBRATION PROCEDURES FOR MILLIMETRIC CASSETTES ARE EXPLAINED.

IN ORDER TO CALIBRATE A SFD USING INCHES CASSETTE IT IS ENOUGH TO FOLLOW THE SAME PROCEDURES USING A 10" X 12" CASSETTE INSTEAD OF A 24 X 30 CASSETTE.

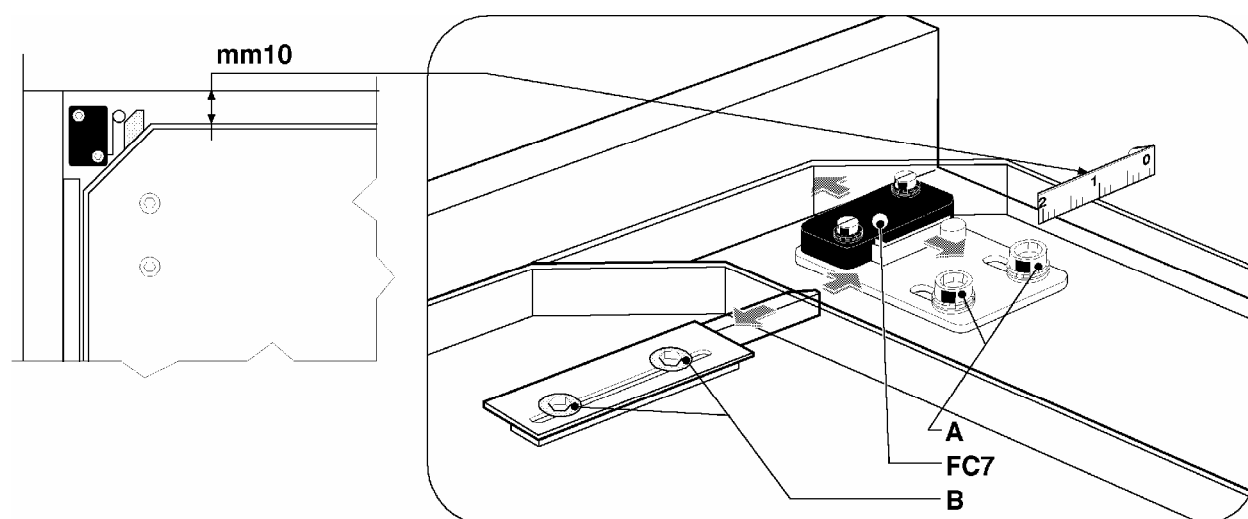
13.2 CASSETTE TRAY MICRO SWITCHES MECHANICAL SETTING

This calibration allows setting the cassette movements run limits and consist on the regulation of the two ends of travel micro switches.

Parking position micro switch mechanical setting

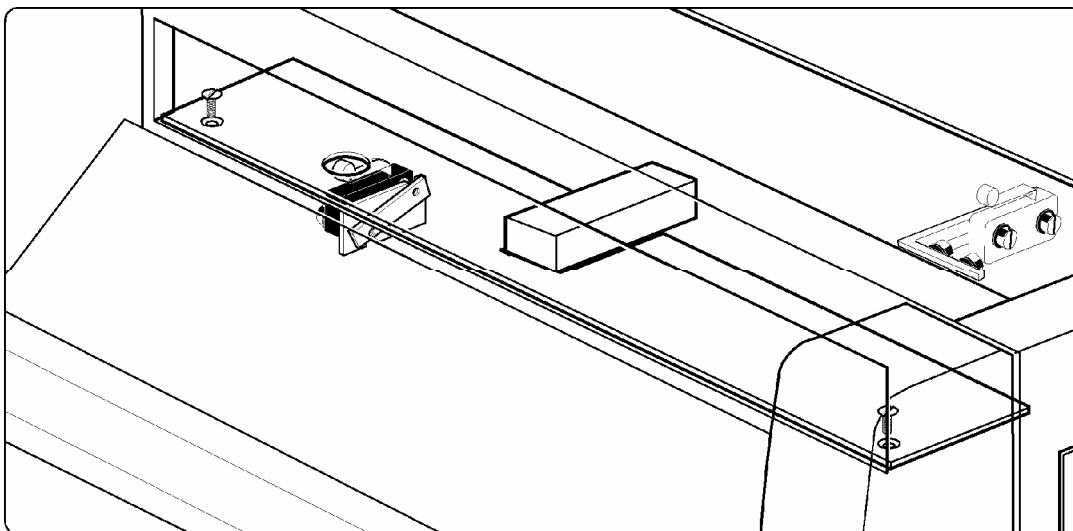
This calibration is carried out by displacing the cam that depresses the cassette holder limit switch.

1. Enter the SFD service mode as described in section **13.1**.
2. Remove the SFD top cover to access the parking position micro switch
3. Insert a generic cassette into the SFD and park it.
4. Check that the distance that remains between the bottom of the spot film device and the rear side of the cassette holder is 10 mm as shown in the following figure.
In the positive it is not necessary to adjust the position of the micro switch and it is possible to jump to step 8, otherwise correct the position of the cam that activates the cassette parking position limit switch as hereinafter described.
5. Press button **15** and move the cassette tray away from the parking position to free the limit micro switch. Adjust, if necessary, the position of the limit micro switch **FC7** by releasing screws **A** as shown in the following figure.
6. Loosen screws **B** and position the cassette tray cam as determined in **step 4**. Tighten screws **B**.
7. Press button **14** and drive the cassette tray to the parking position. Return to **step 4**.
8. Exit the maintenance mode pressing the **preparation** button or switching the unit off

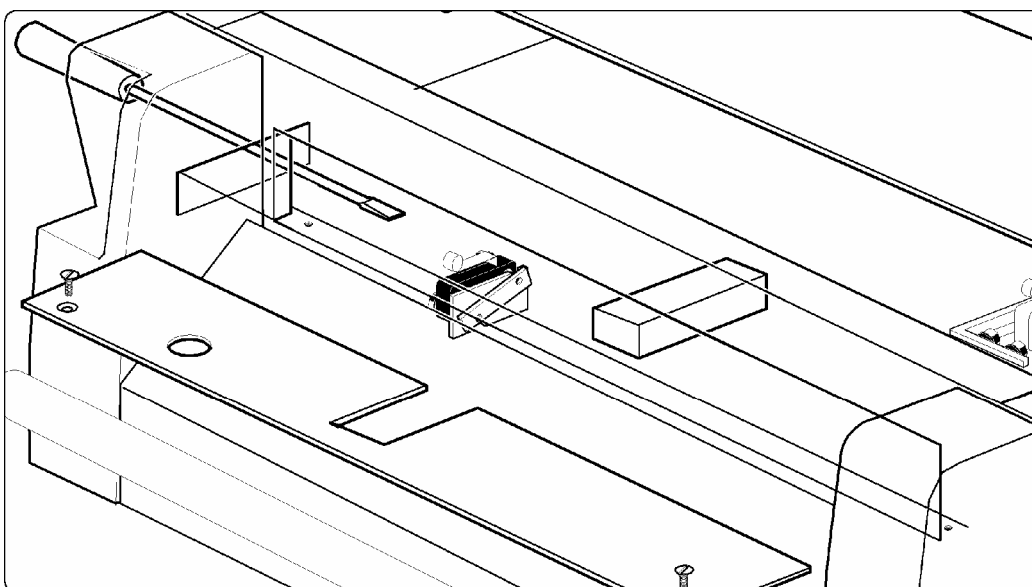


External stop micro switch mechanical setting

1. Enter the SFD service mode as described in section **13.1**.
2. Remove the steel cover that protects the micro switch as shown in the following figure

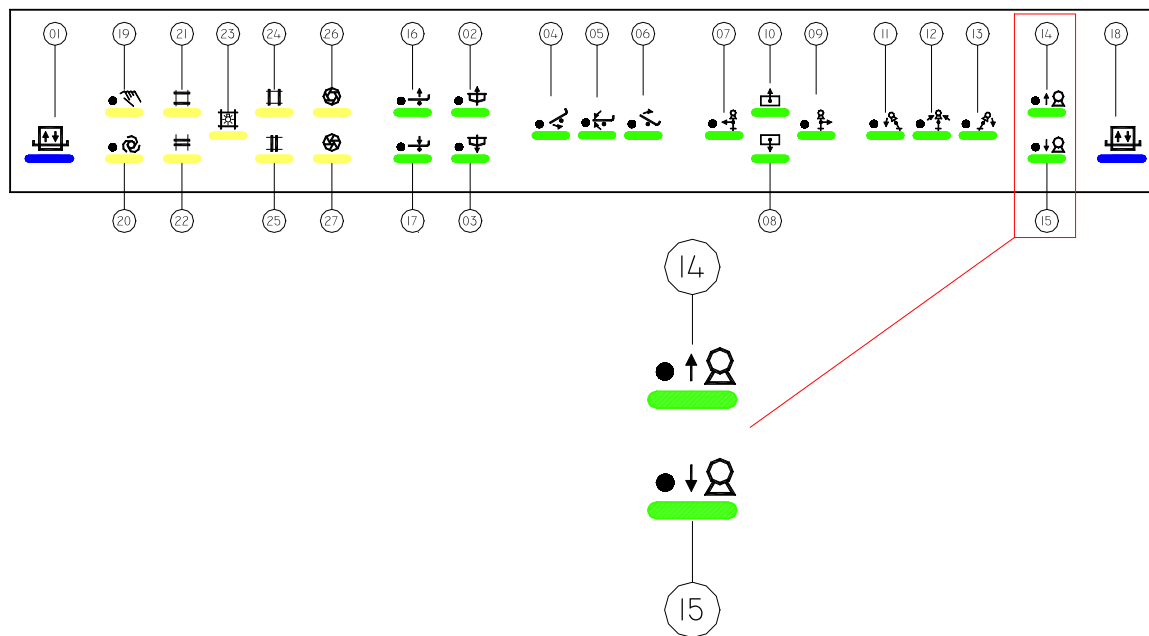


3. Press button **15** and move the cassette tray to the external of the SFD until it stops on the limit micro switch.
4. Check that the stop position allows an easy introduction of the cassette in the tray. In the positive jump to step 6, otherwise continue with the adjustment procedure.
5. Press button **14** and move the cassette tray away from the external position to free the limit micro switch.
6. Correct the micro switch position loosening the screws that hold the micro switch supporting plate as shown in the following figure.



7. Tighten the micro switch supporting plate screws, and return to **step 3**.

8. Mount the steel cover.
9. Exit the maintenance mode pressing the **preparation** button or switching the unit off

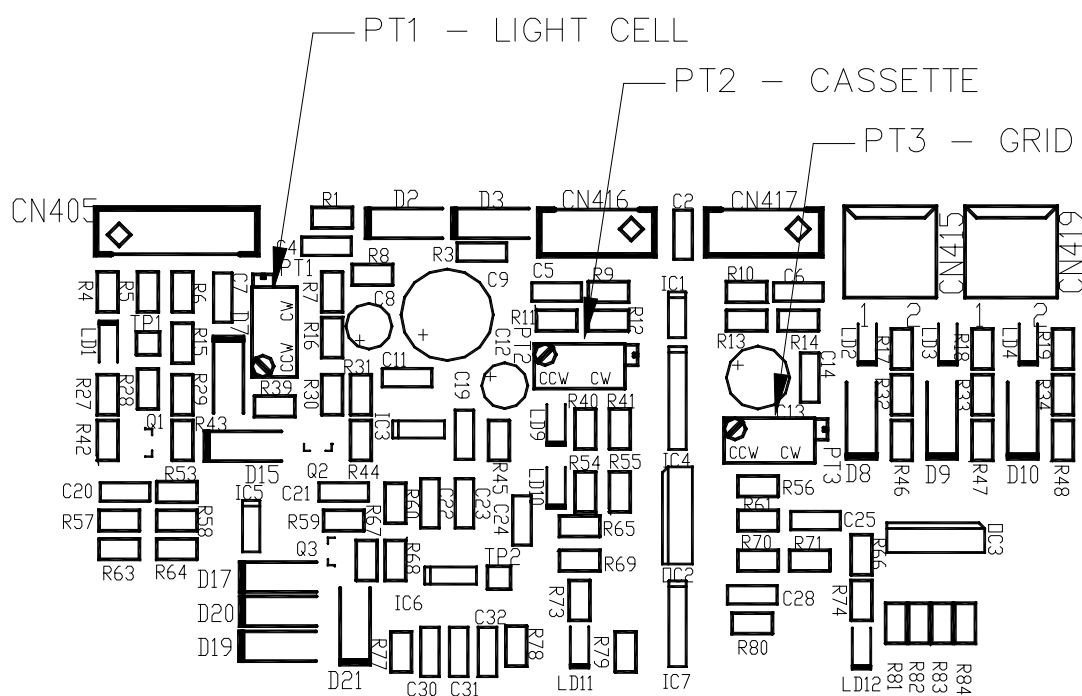


13.3 PROXIMITY SWITCHES SENSING CIRCUITS CALIBRATION

The SFD uses two magnetic proximity switches to recognize the cassette format and to detect the grid position for the correct exposure release. Hereinafter there is the correct calibration procedure of the proximity switch sensing circuit.

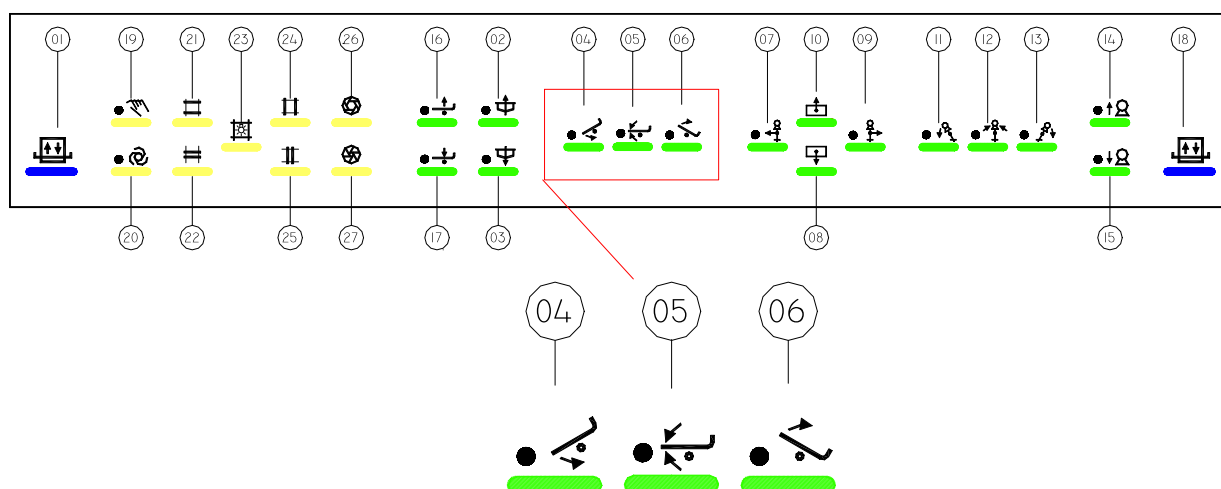
Cassette tray proximity switch sensing circuit calibration

1. Enter the SFD service mode as described in section **13.1**.
2. Remove the SFD bottom cover to access the SFD CPU board.
3. Using pushbuttons **14** and **15**, move slowly the cassette tray in the way that it passes more times, in the two directions, over the proximity switch.
4. Check that when the 2 metal plates mounted on the bottom side of the cassette tray pass over the proximity switch, the corresponding signaling led **LD9** lights shortly.
5. In the negative, check that in all tilt conditions the bottom plates of the cassette tray are set at about 2-3 mm. from the proximity sensor input surface. If this distance is not correct, modify it adding or removing spacers under the proximity switch board. If the distance is correct, turn potentiometer **PT2** to correct the sensitivity of the sense circuit.
6. Calibrate the cassette format identification system as described in **section 12.4.8** of the manual.
7. Mount the SFD bottom cover.
8. Exit the maintenance mode pressing the **preparation** button or switching the unit off



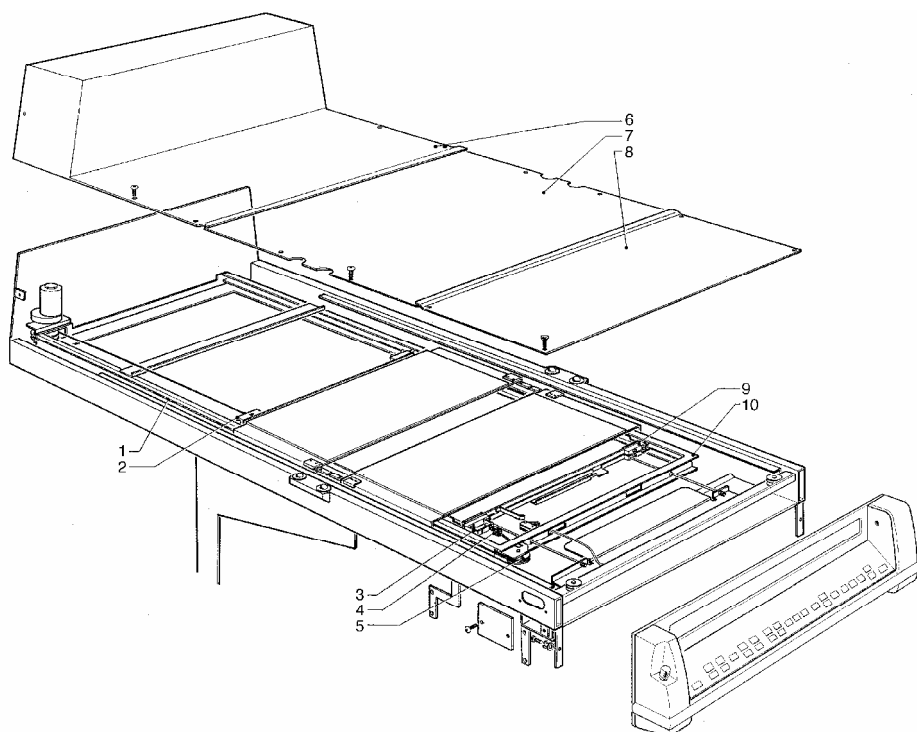
Grid proximity switch sensing circuit calibration

1. Enter the SFD service mode as described in section **13.1**.
2. Remove the SFD bottom cover to access the SFD CPU board.
3. Activate the grid motor pressing pushbutton **04** and check that when the cams of the connecting rod or the grid frame pass in front of the proximity switch **LD10** Lights shortly.
4. In the negative turn potentiometer **PT3** to correct the sensitivity of the sense circuit.
5. Mount the SFD bottom cover.
6. Exit the maintenance mode pressing the **preparation** button or switching the unit off



13.4 NEAR FILM SHUTTERS WIRE ROPE REPLACEMENT

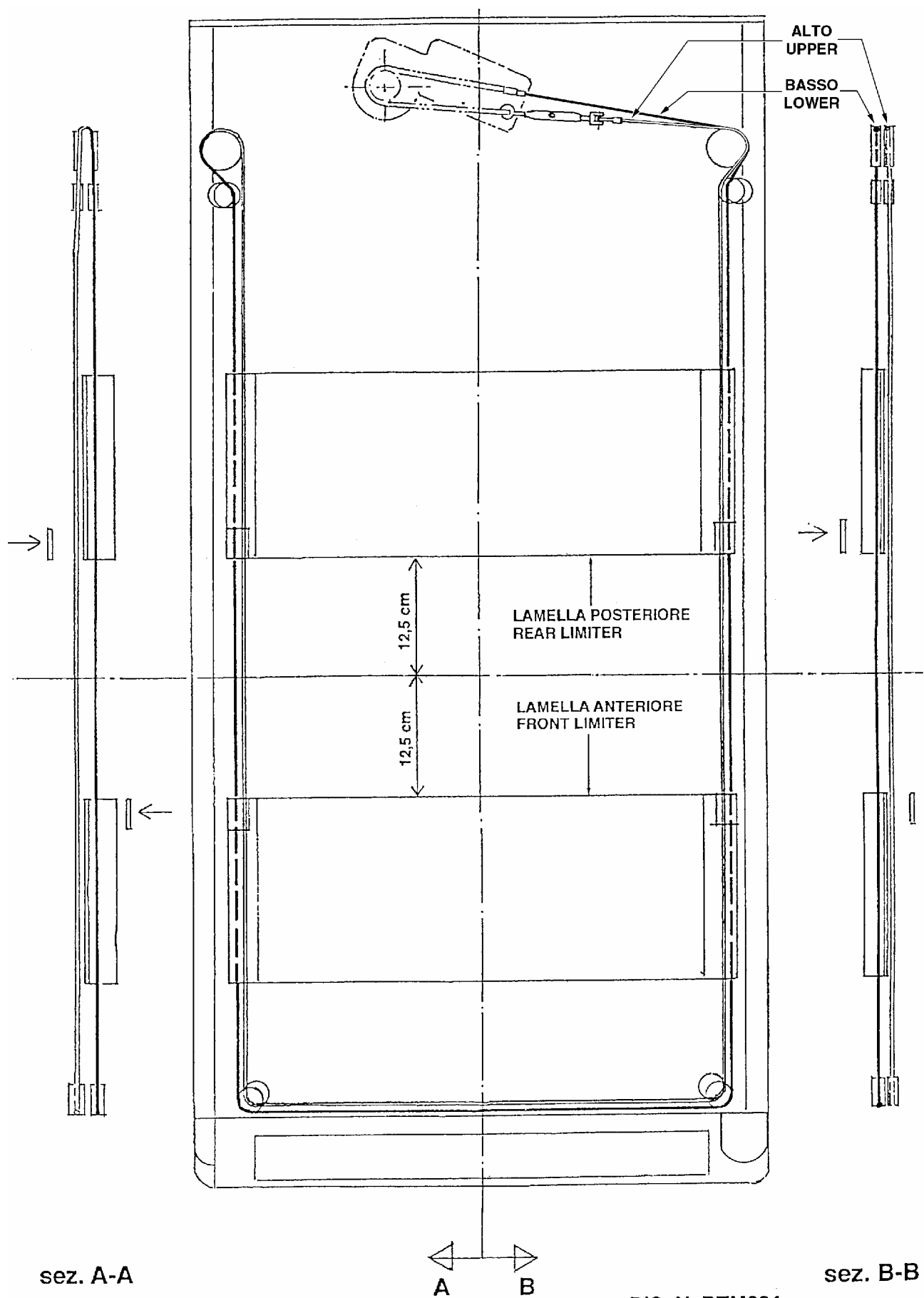
1. Drive the table to its horizontal stop.
2. Remove the tabletop assembly carrying out, in the reverse order, the instructions contained in **section 6.8**.
3. Remove the SFD upper covers as shown in the following figure:

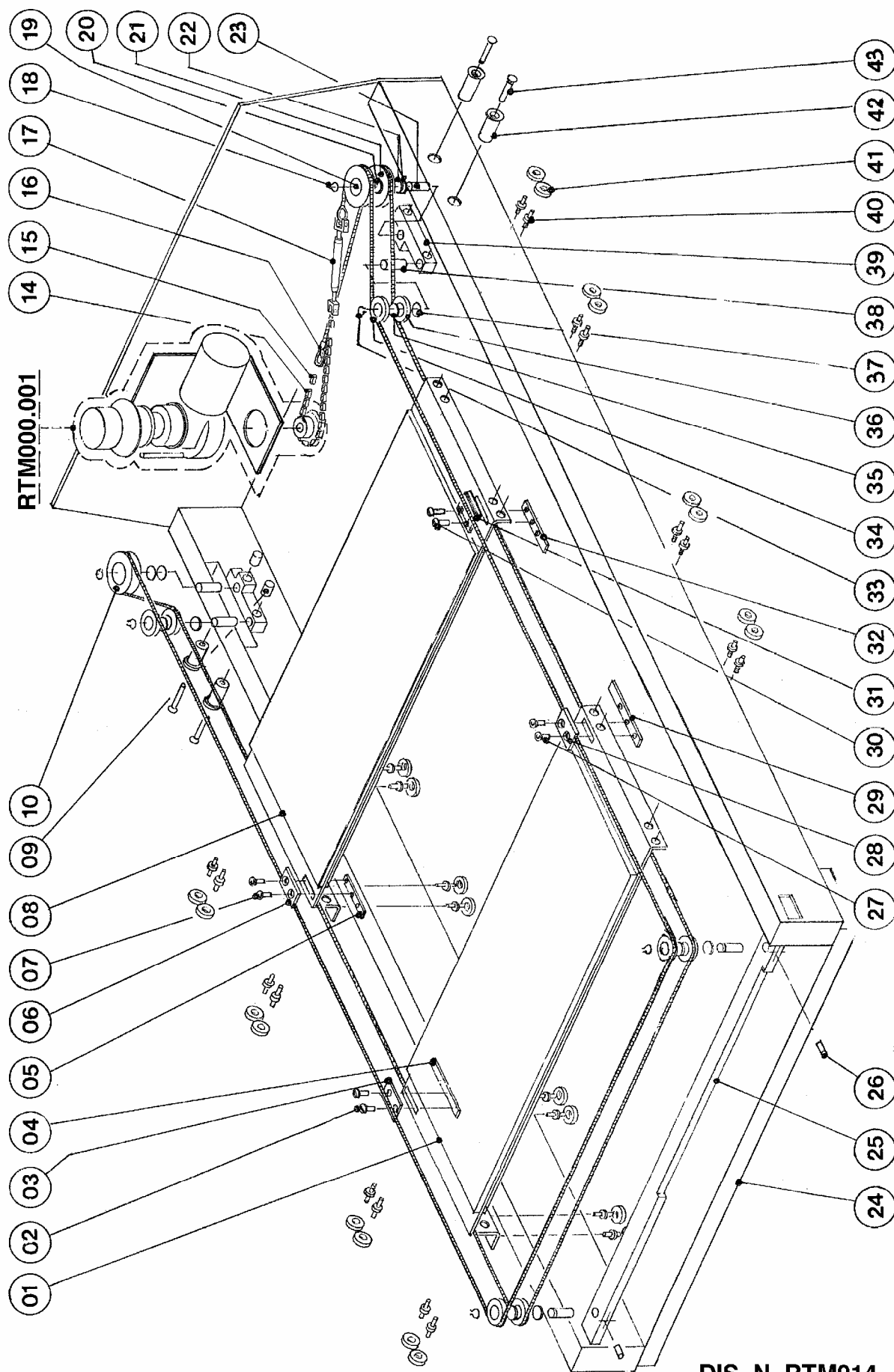


4. Make a reference mark between the two sleeves **42** and the frame in order to be re-assemble them in the same position.
5. Release fixing screws **43** of the pulleys support blocks **39**.
6. Release all the terminal-screws on the front limiting device **3** and **28** and on the rear-limiting device **6** and **31**.
7. Remove the wire rope **16**.
8. Remove the chain **14**, the joints **15** and the turnbuckles **17** from the wire rope.
9. Mount, on one end of the new wire rope, by means of the joints, the chain and the part of turnbuckle composed by the eye and the brass sleeve.
10. Mount, on the other end of the wire rope, the turnbuckle.
11. Assemble the chain on gear **13**, keeping it locked by means of a small band. Be careful that the two extremities of the chain are in pair.
12. Assemble on the SFD the pulley assembly **39** without fixing them.
13. Starting from pulley **21**, mount the wire rope following the diagram of the following drawing.

Once made the wire rope has been completely routed, connect the turnbuckle closing the rope circle.

14. Tighten screws **43** of assembly **39** until the two marks previously made on sleeves **42** coincide.
14. Verify that all pulleys rotate freely and then tighten the rope.
Fix temporarily the turnbuckle to the rope, by means of the terminal screws, in order to allow the manual displacement of the shutters as respect as the rope, during the calibrations.
15. Verify that the chain extremities **14** are equidistant from the cogwheel **13** of the movement transmission.
16. Using as reference the SFD central axis evidenced by two markers in the chassis, position the 2 shutters at a distance of 12.5 cm from the center axis.
Lock the shutters terminal screws.
16. Switch the table on and check the correct film division.
In case adjust it following the instructions contained in section **12.4.5** and **12.4.6**.
17. Mount back the SFD upper covers and the patient tabletop.





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13.5 NEAR FILM SHUTTERS ADJUSTMENT

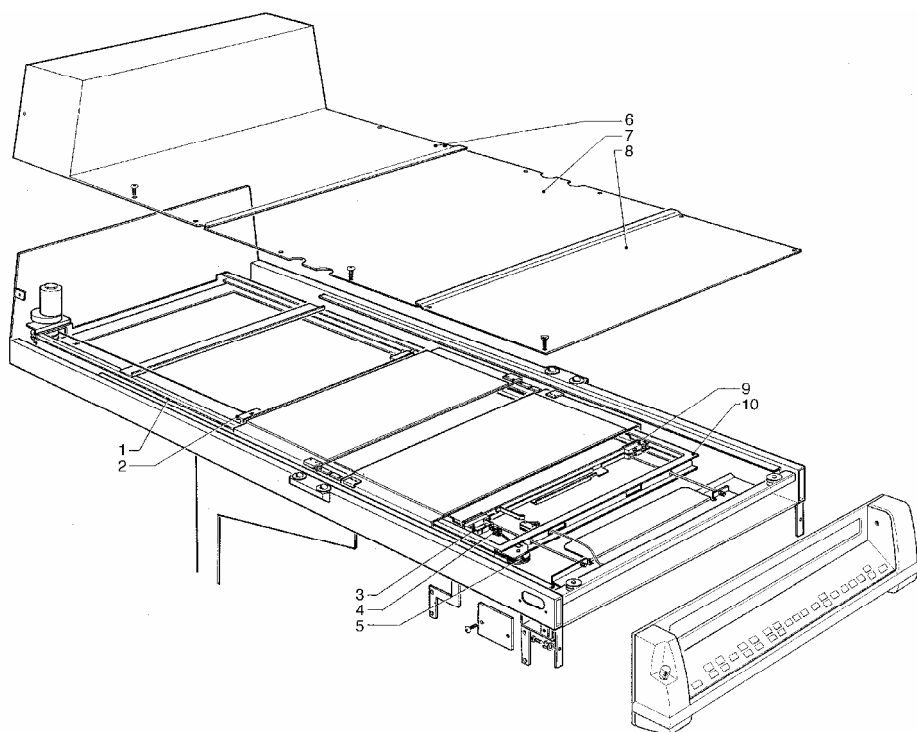
The calibration of the near film shutters is divided into 2 parts:

- A) Parallelism calibration;
- B) Shutters maximum open limit micro switch setting.

Before carrying out these two following adjustments check that the cable that leads the blades is correctly mounted.

Parallelism regulation

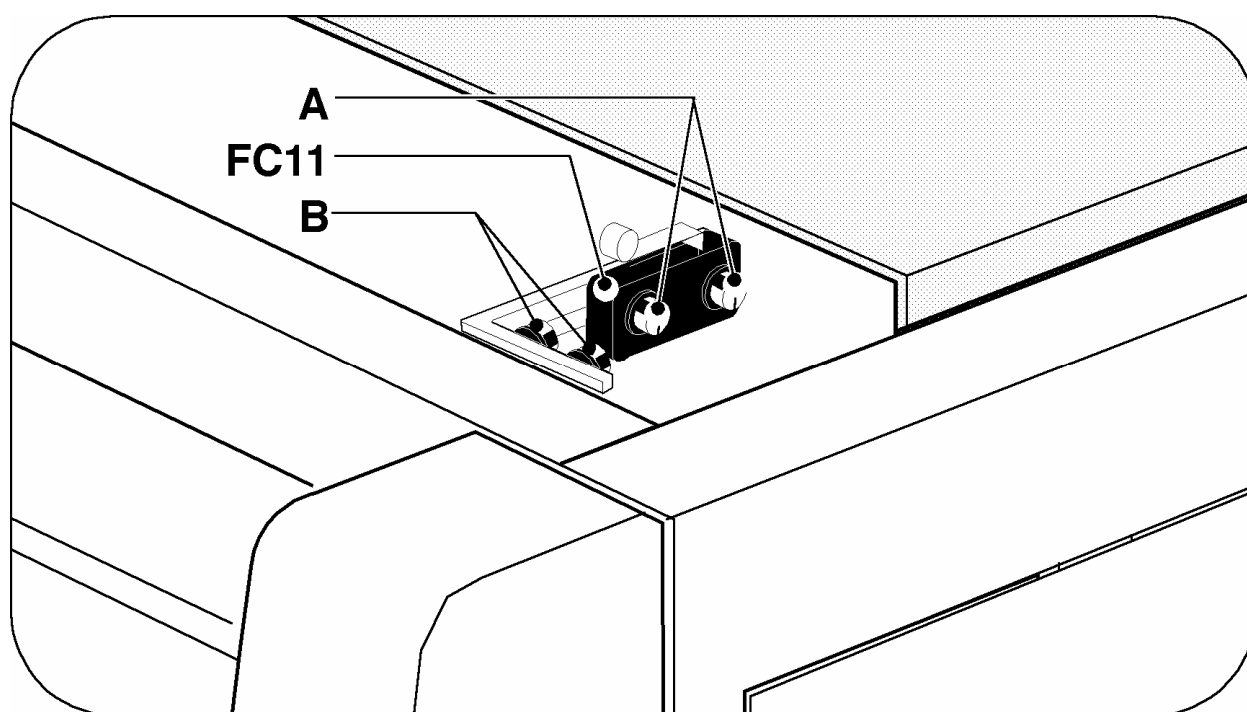
1. Enter the SFD service mode as described in **section 13.1**.
2. Remove the tabletop assembly carrying out, in the reverse order, the instructions contained in **section 6.8**.
3. Remove the SFD upper covers as shown in the following figure:



4. Using buttons **8** and **10** drive the near film shutters approximately halfway.
5. Measure the distances between the back of the spot film device and the right and left extremities of the most internal blade.
6. If these distances are equal, the internal blade is well aligned, otherwise correct the parallelism by releasing one of its extremities.
7. Considering the center of the spot film device (indicated by two markers on the SFD chassis) and adjust the position of the most external blade so as to obtain the symmetry of the two blades in respect to the above center.

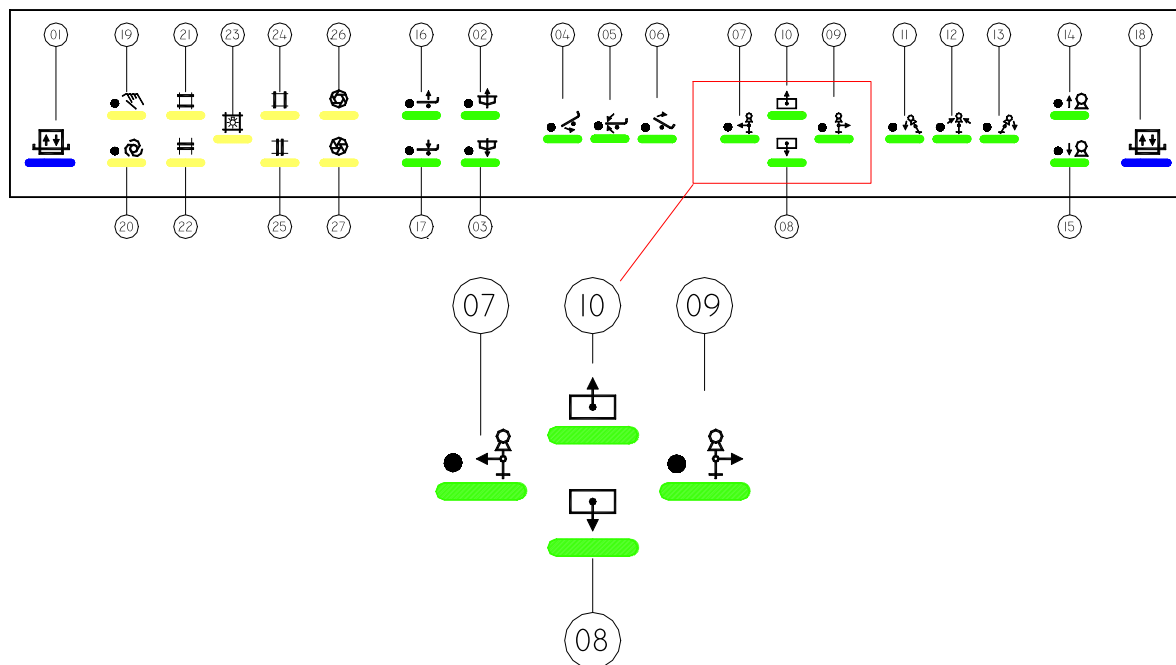
Shutters maximum open limit micro switch setting.

8. Pressing button **08** open by small steps the shutters until the limit switch is activated.
9. Measure the distance between the blades and check if it is equal to 43.5 cm.
10. In the negative, proceed as follows:
 - a) Close the shutters pressing button **10**.
 - b) Loosen screws **B** to correct the position of the limit micro switch **FC11** as shown in the following figure.
 - c) Resume the procedure from step 8.
11. Mount the SFD bottom cover.
12. Exit the maintenance mode pressing the **preparation** button or switching the unit off.
13. Switch the table on and check the correct film division. If necessary, adjust it following the instructions contained in section **13.6**.



WARNING:

If the switch is moved backward, the shutters shall open more, if it is moved forward they will open less; besides, the displacement of 1 mm. of the switch causes a variation of 2 mm. (the double) in the opening distance of the shutters.



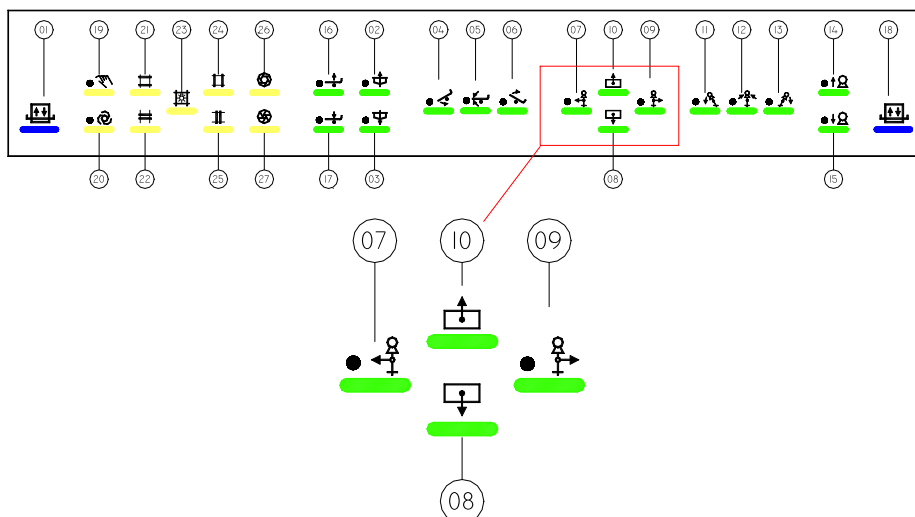
13.6 ADJUSTMENT OF SFD DIVISION

WARNING

THE OPERATIONS DESCRIBED HEREAFTER REQUIRE THE USE OF X-RADIATION. CONSEQUENTLY THE OPERATORS ARE REQUESTED TO TAKE ALL THE NECESSARY PRECAUTIONS IN ORDER TO AVOID ANY TYPE OF EXPOSURE WHETHER DIRECT OR INDIRECT.

1. Insert a generic cassette into the SFD and park it.
2. Select a film division.
3. Expose the film as many times as it is necessary and develop it.
4. Check the distance between the divisions and, if necessary, modify it carrying out the following procedure:
 - a. Enter the SFD service mode as described in **section 13.1**.
 - b. Press button **01** to enable the film division setting routine.
If the film division routine has been enabled, led **07** and **09** will be turned OFF.
 - c. Press button the distance between the divisions must be reduced or button **08** if this distance must be increased.

Each time the button is pressed the distance is increased or reduced by **1.0 mm step**; led **09** shows the activation of button **10**, while led **07** shows the activation of button **08**.
 - d. When the desired adjustment has been achieved, press key **01** to store in the 80C166 CPU eeprom the new calibration data and automatically exit the film division setting routine.
5. Exit the service mode pressing the **preparation** button or switching the unit off.
5. Expose another film to verify the correct setting of film division and, if necessary, repeat the adjustment procedure until the desired result is reached.



13.7 GRID PARKING MICRO SWITCHES MECHANICAL SETTING

This calibration allows setting the grid parking run limits and consist on the regulation of the two ends of travel micro switches.

Grid parking position micro switch mechanical setting

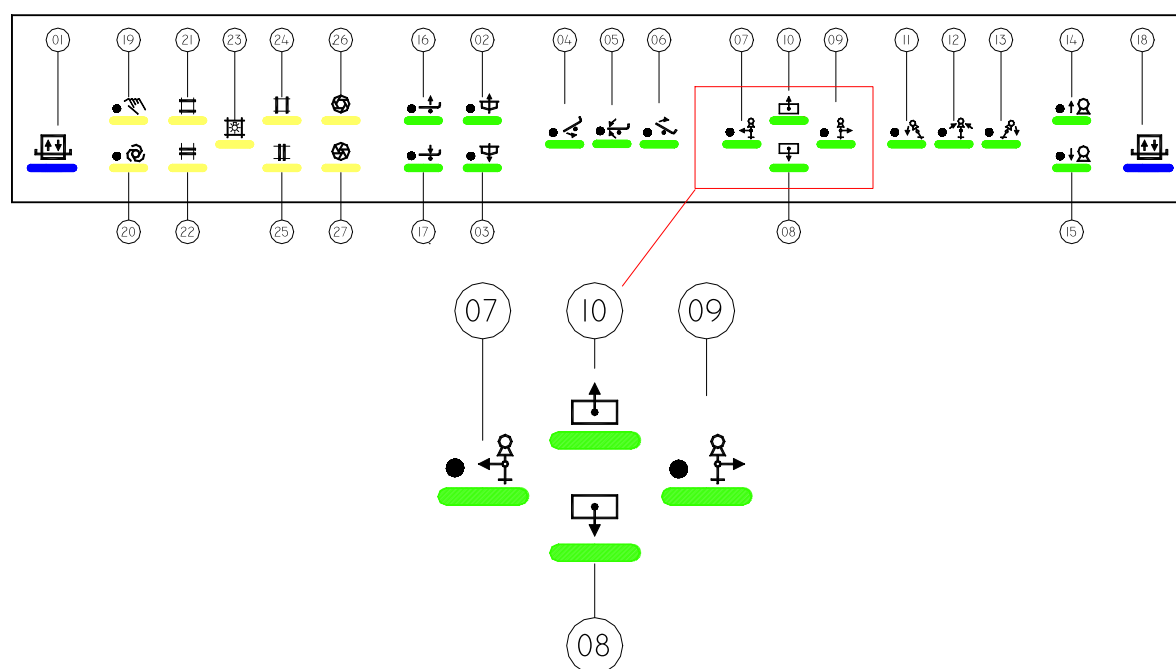
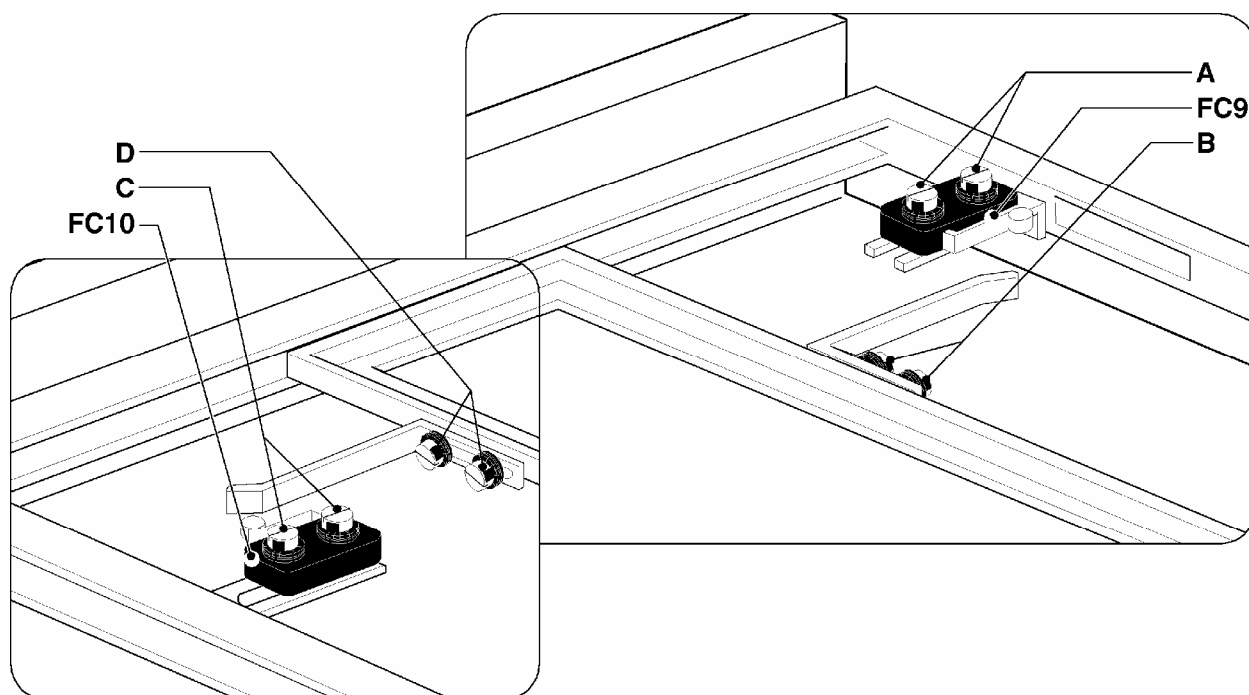
This calibration is carried out by displacing the cam that depresses the grid movement limit switch.

1. Enter the SFD service mode as described in section **13.1**.
2. Remove the SFD top cover to access the grid parking position micro switch
3. Press button **x** and move the grid assembly away from the parking position to free the limit micro switch and drive it back to its park position. Adjust, if necessary, the position of the limit micro switch **FC9** by releasing screws **B** as shown in the following figure.
4. Adjust, if necessary, the position of the limit micro switch **FC9** by releasing screws **A** as shown in the following figure.
5. Exit the maintenance mode pressing the **preparation** button or switching the unit off

Grid in the field position micro switch mechanical setting

This calibration is carried out by displacing the cam that depresses the grid movement limit switch.

6. Enter the SFD service mode as described in section **13.1**.
7. Remove the SFD top cover to access the grid in the field position micro switch
8. Press button **x** and move the grid assembly away from the parking position to free the limit micro switch and drive it back to its park position. Adjust, if necessary, the position of the limit micro switch **FC10** by releasing screws **D** as shown in the following figure.
9. Adjust, if necessary, the position of the limit micro switch **FC10** by releasing screws **C** as shown in the following figure.
10. Exit the maintenance mode pressing the **preparation** button or switching the unit off



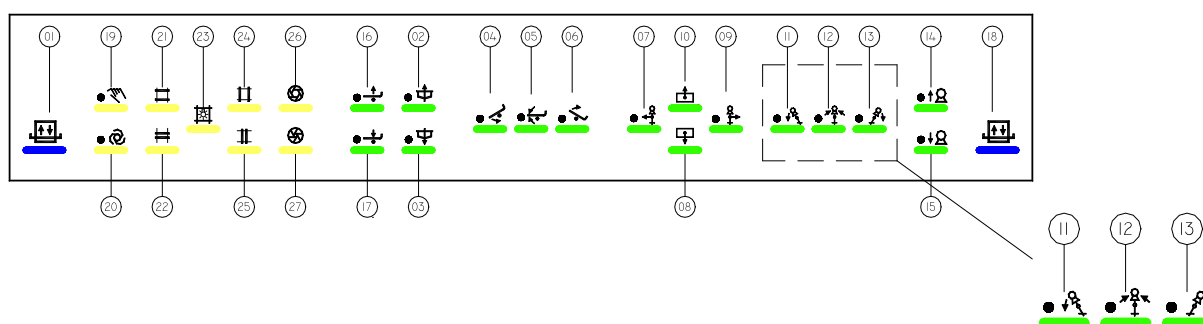
13.8 CALIBRATION OF CASSETTE FORMAT IDENTIFICATION SYSTEM

This procedure is to be carried out each time one of the following cases verifies:

- A) The cassette in limit stop cam is moved from its calibration position.
- B) For any reason the proximity switch that detects the cassette size is disassembled or reassembled (this proximity is fixed on the spot film device structure near the parallax correction carriage).
- C) At the time of the new installation because the cassettes of various manufacturers normally have external dimensions slightly different.
- D) Each time the spot film device does not identify any more the cassette size. In this case, before carrying out again this calibration make sure that the cassette is not defective (maybe deformed).

For carrying out the following procedure a 24x30 cm. cassette must be used:

- 1 Enter the SFD service mode as described in section **13.1**.
- 2 Bring the cassette tray outside (if is necessary) using button **18**.
- 3 Load the SFD with a 24x30 cm. cassette with the 24-cm. side in the direction of the cassette holder displacement (with the 30-cm. side in the direction of patient's length).
- 5 Depress pushbutton **12**.
This key orders to the spot film device microprocessor to memorize, in the non-volatile memory, calibration parameters. Such parameters are offsets by means of which, subsequently, the microprocessor itself is able to identify any other cassette size.
- 6 Exit the maintenance mode pressing the **preparation** button or switching the unit off.

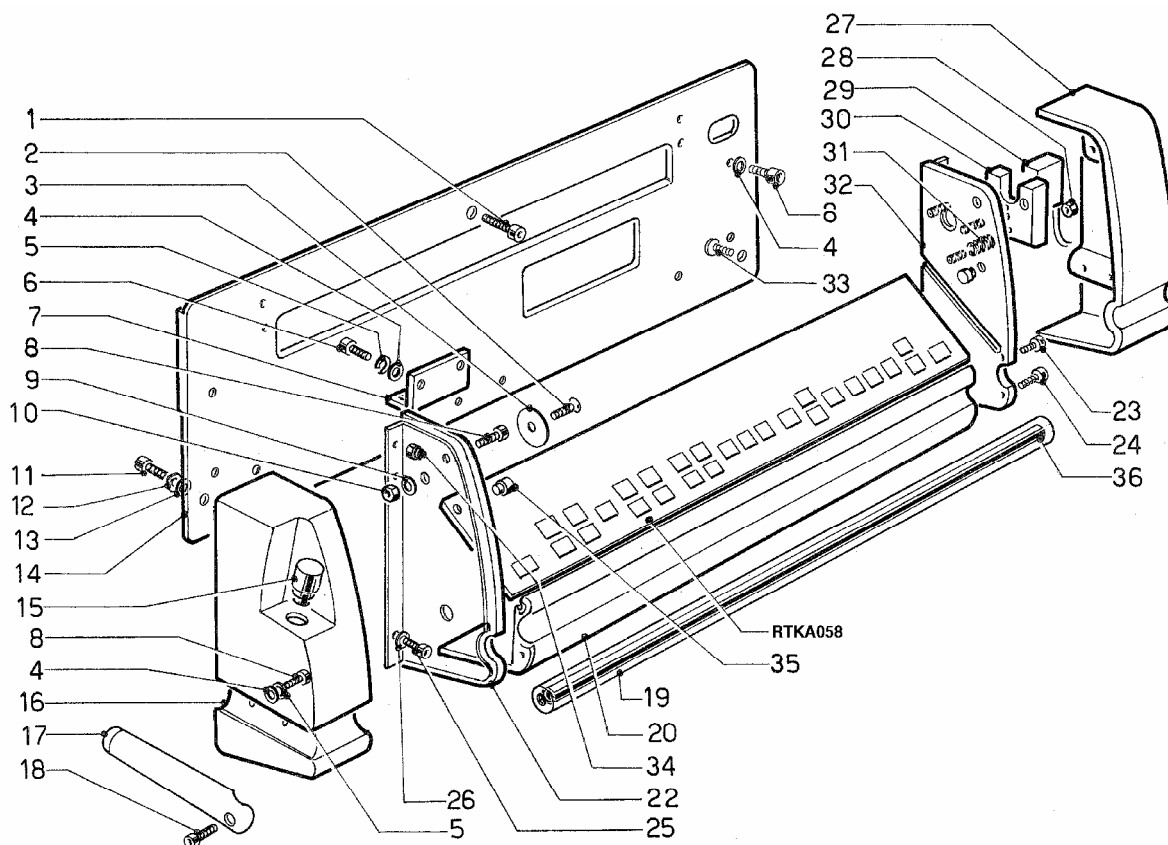


13.9 CASSETTE SAFETY LIGHT CELL ADJUSTMENT

1. Remove the SFD lower covers. Remove the SFD electronic sub rack cover to freely access the electronic boards.
2. Access the light cell assembly by removing cover **27** and the protection bar **36**. These parts are mounted on the SFD chassis by means of screws **18**, **33** and **35**.
3. Disable the light cell safety.
4. Switch the unit on, and drive the table to its horizontal stop position.
5. Insert a 35x43 cassette in the cassette tray, with the 43-cm side in the patient length.
6. Move a 10-mm spacer along the cassette side on the cassette tray handle and verify that led 7 on the SFD interface board is never set on. That means that the light cell safety circuit is correctly activated. Be careful to move the spacer in the way that only the spacer can interrupt the light beam.
7. In case there are positions in which the safety circuit is not activated, adjust the self-locking nut **28** to properly align the infrared beam.
8. Move a 5-mm spacer along the cassette side on the cassette tray handle and verify that led 7 on the SFD interface board is always off. That means that the light cell safety circuit is never activated.
9. In case there are positions in which the safety circuit is activated, adjust the self-locking nut **28** to properly align the infrared beam. Repeat the adjustment procedure from point **6**.
10. Check proper light cell alignment tilting the table to +90° and moving in/out several time the cassette. Repeat the test with different cassette formats.
11. Mount back cover **27**, the sub rack cover and the SFD lower covers.
12. Enable the light cell safety.

WARNING:

IN CASE IS NOT POSSIBLE TO OBTAIN A GOOD ADJUSTMENT, CHECK THAT THE CASSETTE DEFLECTOR DOES NOT PUSH DOWNWARD THE CASSETTE. IF NECESSARY ADJUST IT.



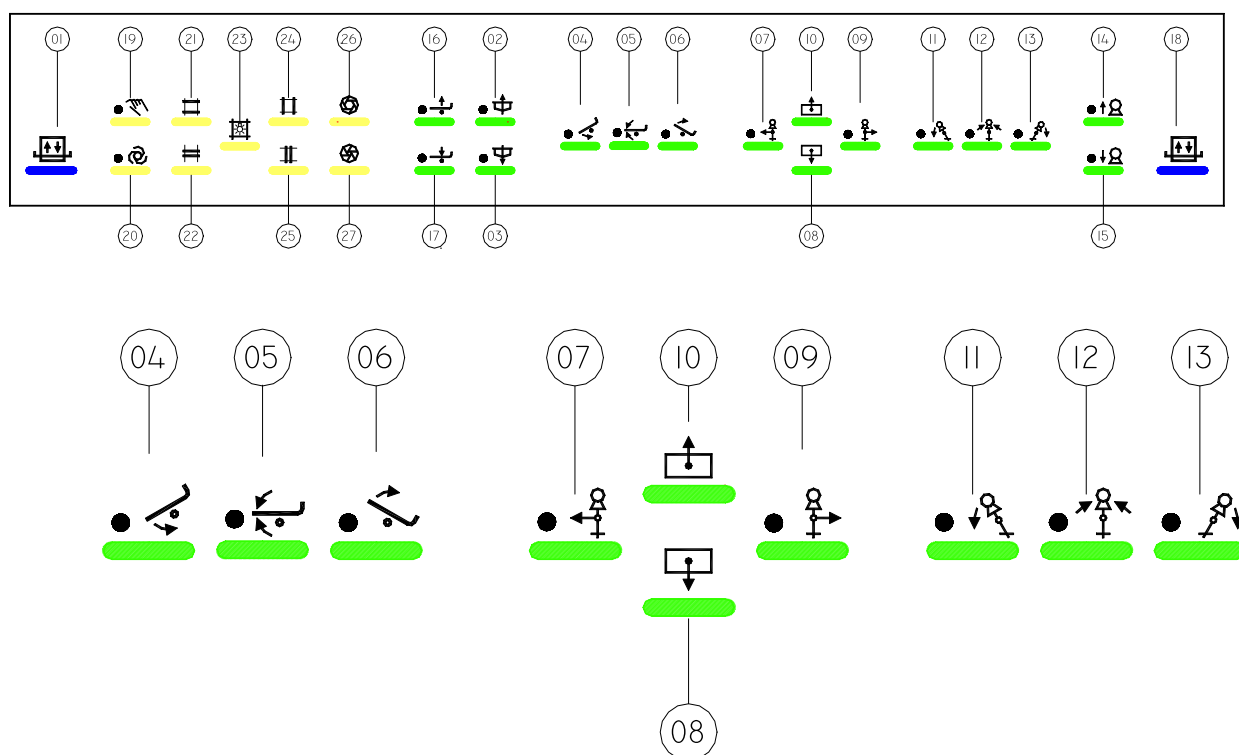
MECALL	DATA 02-09-97	DESCRIZIONE TASTIERA SERIOGRAFO SPOT FILM DEVICE CONTROL DESK	VALIDO DA: A:	FIRMA MULINELLO	VISTO	CODICE RTSA	TAVOLA 1/2
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13.10 ALIGNMENT OF CASSETTE CENTRE WITH SFD CENTRE.

WARNING

THIS PROCEDURE MUST BE CARRIED OUT ONLY WITH THE 24 X 30 CASSETTE INSERTED IN THE SPOT FILM DEVICE IN THE SAME WAY DONE FOR THE CASSETTE SIZE IDENTIFICATION SYSTEM CALIBRATION.

- 1 Enter the SFD service mode as described in section **13.1**.
- 2 Clear the data contained in the EEPROM and in the RAM, pressing button **06**.
- 3 Carry out the cassette size identification system calibration making that procedure from step 2 to step 5.
- 4 Press Pushbutton **03**.
- 5 Check that the center of the cassette is aligned with the center of the spot film device. In the negative modify the position of the cassette center using buttons **07** or **09**.
- 6 When the position is considered to be the correct one depress pushbutton **12** to store the new position in the eeprom.
- 7 Exit the maintenance mode pressing the **preparation** button or switching the unit off.



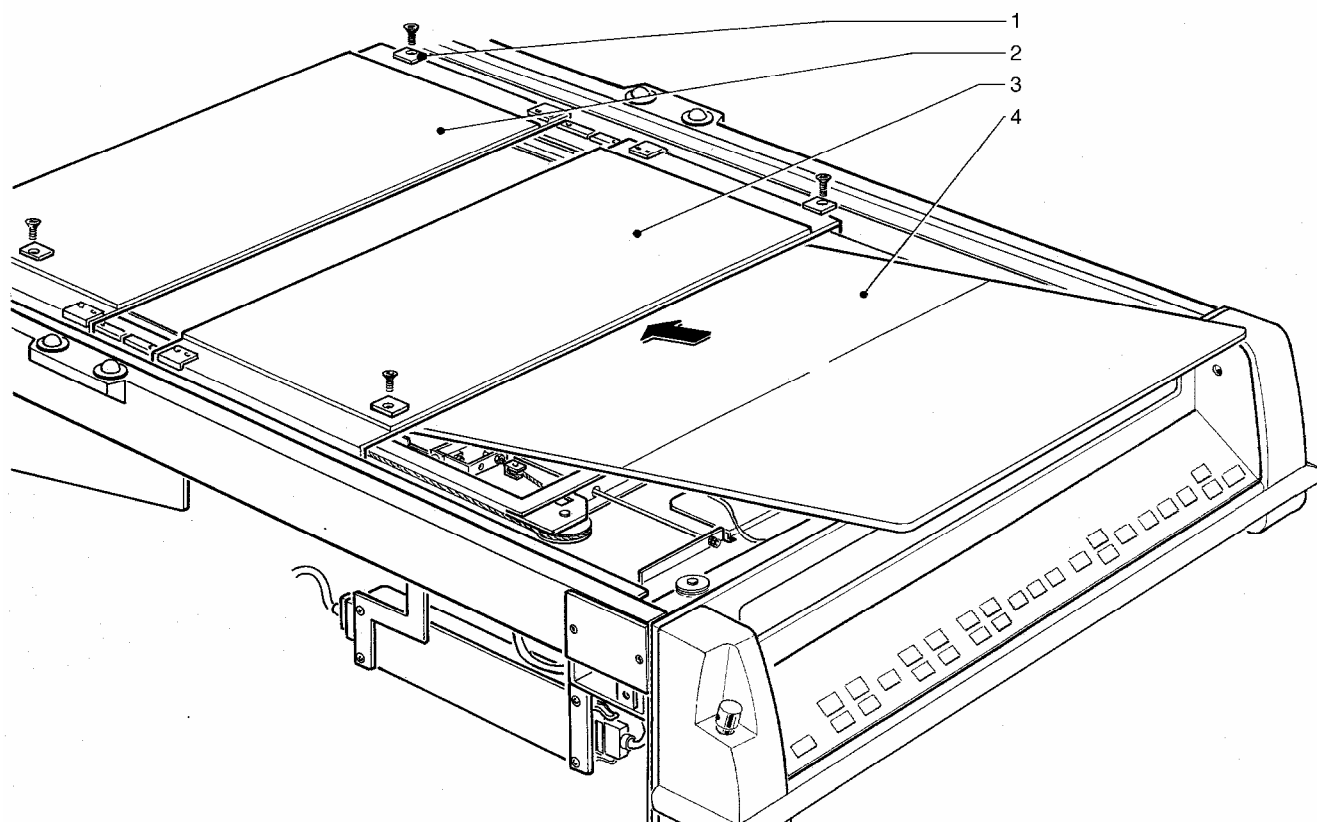
13.11 GRID REPLACEMENT

The grid can be removed from the SFD without removing its supporting frame.
The suggested procedure is the following:

1. Remove the tabletop assembly carrying out, in the reverse order, the instructions contained in **section 6.8**.
2. Open manually the near film shutters **2** and **3** in order to freely access the screws that lock the holding plates to the grid frame.
2. Close the near film shutters and replace the grid **4** as shown in the following figure.
3. Once the grid has been inserted, position carefully the holding plates and fix them.

WARNING

THE GRID IS GENERALLY INSTALLED IN FACTORY DURING THE UNIT FINAL TESTS. FOR THIS REASON, DURING SYSTEM INSTALLATION YOU ARE NOT REQUIRED TO INSTALL THE GRID UNLESS OTHERWISE INDICATED.



13.12 AEC DETECTOR REPLACEMENT

1. Remove the tabletop assembly carrying out, in the reverse order, the instructions contained in **section 6.8**.
2. Remove the SFD upper covers.
3. The AEC detector is placed inside a special frame positioned below the grid assembly. For this reason is necessary to remove the grid frame as indicated in the following procedures.

A - GRID WITH PARKING OPTION

- a1 Disconnect from one side of the frame the rope tightened **4.8**, loosening the stretching nut and the locking screw **2.8**.
- a2 Remove the hexagon screws that fix, on the opposite side of the movement assembly, the blocks **9.8** with the sliding rollers in the external frame **10.8**.
- a3 Close the near film shutters and pull back the frame as necessary to pull up from the front side and take it out from the external frame.

B - GRID WITHOUT PARKING OPTION

- b1) Remove the 4 screws that fix the connecting brackets of the grid frame to the external frame.
- b2) Loosen the screws that fix the brackets to the internal frame (it is enough in one side only).
- b3) Push back the brackets until the frame can come out from the external one.
- b4) Close the near film shutters **2.12** and **3.12** (see section **6.12**) and exit the grid frame from the front side after having pulled it back and raised it up on the front side as indicated in fig. **12**.

In this moment it is possible to start with the installation of the AEC detector.

- 3) Remove the screws and the related blocks **3.10** used to fix the detector into its frame.
- 4) Insert the detector in the middle of the near film shutters **1.10** and **4.10**, and close them as necessary to free the cable **7.10** that must be inserted inside the openings **5.10** and **6.10** prepared in the frame.
- 5) Open the near film shutters and position correctly the detector into its frame.
- 6) Close the near film shutters and fix the detector to its frame in the three provided points using the holdings blocks **3.10** and the related screws.
- 7) Position and fix with great attention the cable **1.11** that from the detector **2.11** must reach the preamplifier **4.11**.
- 8) Mount the grid frame using the reverse procedure adopted for the grid removing.

- 9) If the unit **is not equipped** with the grid parking option, fix the holding brackets at any grid frame's corner with the AEC detector frame. Lock the screws that fix the holding brakes to the grid frame.
- 10) If the unit **is equipped** with the grid parking option, mount the rollers holders on the grid frame and adjust them until the movement between the two frames is smooth and with a minimum clearance.

WARNING:

THE AEC DETECTOR IS GENERALLY INSTALLED IN FACTORY DURING THE UNIT FINAL TESTS. FOR THIS REASON, DURING SYSTEM INSTALLATION YOU ARE NOT REQUIRED TO INSTALL THE AEC DETECTOR UNLESS OTHERWISE INDICATED.

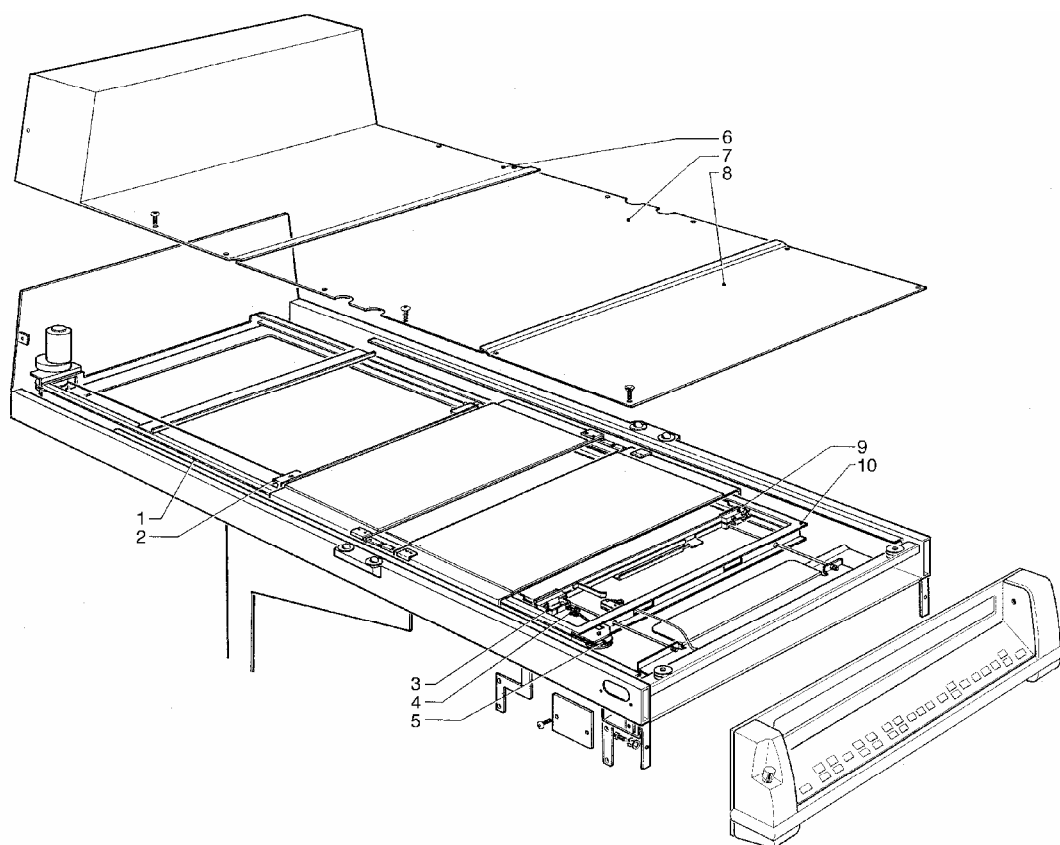


FIG. 8

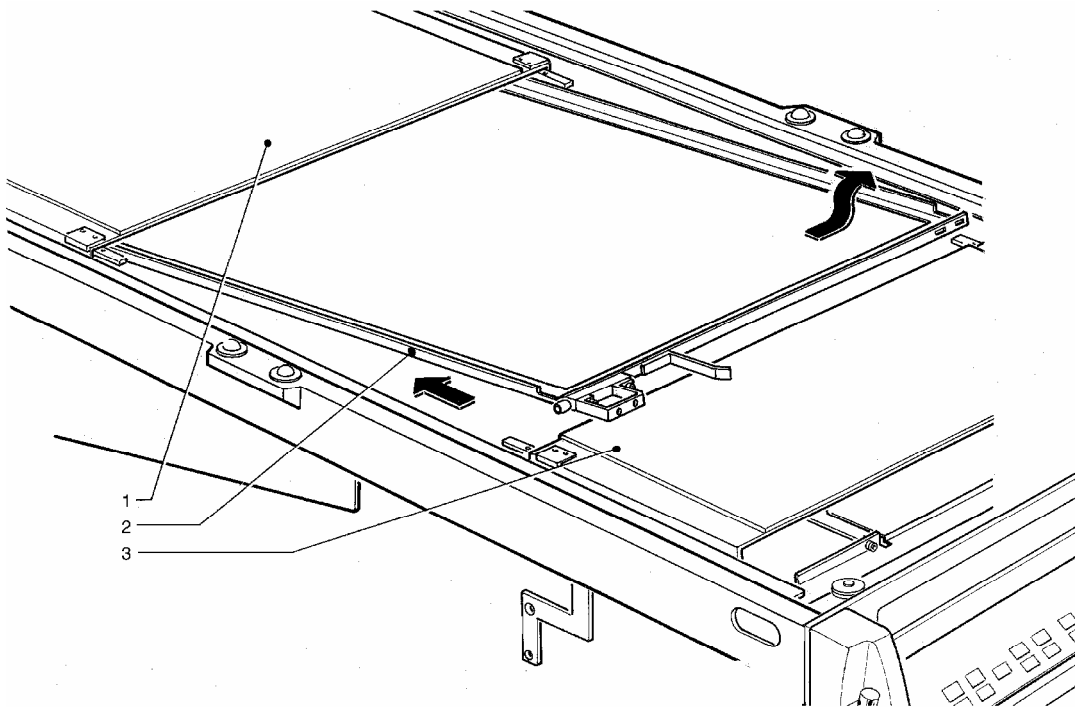


FIG. 9

8. Route the AEC detector cable as shown in the following figure.

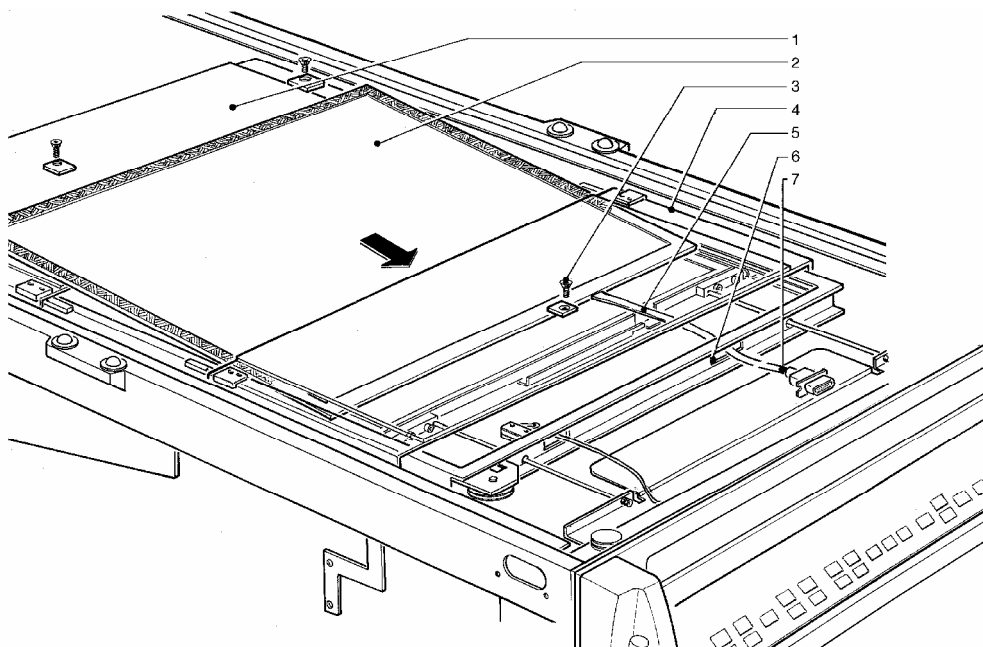


FIG. 10

